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Northern Region Landbird Monitoring Program: A USFS-University of Montana Partnership Designed to Provide Both Short-term and Long-term Feedback for Land Managers

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Abstract—*The Northern Region Landbird Monitoring Program (NRLMP) began in 1990 as a cooperative effort between the United States Forest Service (USFS) and the University of Montana. The combination of a research-oriented perspective from the University and a management-needs perspective from the National Forests within the Northern Region led to the realization that landbirds as a group might serve as a powerful tool to address more widespread monitoring needs in the USFS Northern Region. The program quickly evolved from one that was put into place specifically to use federally earmarked dollars to address neotropical migratory bird conservation, into a more general region-wide monitoring program. Today, the program is uniquely designed to provide two kinds of monitoring activity—one is conducted during even-numbered years and is designed to shed light on the long-term population trends and habitat relationships of numerous landbird species within the region; the other is conducted during odd-numbered years and is designed to shed light on the ecological effects of various kinds of land use activity. The University of Montana had (and continues to provide) the expertise needed to handle the design, training, data management, analysis, and information dissemination components, while the USFS had (and continues to provide) the funding needed to hire seasonal technicians who conduct the actual bird monitoring and it has the management needs that serve as the primary driver of short-term management effects assessments. It is the short-term management effects monitoring and the habitat-relationships information that have generated the most support for the monitoring program within the USFS. Overall, the program is widely viewed as useful and successful, but obstacles that still need to be overcome include (1) the incorporation of monitoring results into a more formal adaptive management cycle within the USFS, and (2) the inclusion of additional state, federal, and private corporation partners so that the program emerges as one part of a more comprehensive statewide (or broader) landbird monitoring program, and (3) the recognition that monitoring buy-in involves support for more than the field effort involved with data collection.*

History of the Partnership

The origin of the Northern Region Landbird Monitoring Program (NRLMP), a cooperative effort between the United States Forest Service (USFS) and the University of Montana, can be traced to a landmark meeting held in Atlanta in the fall of 1990. That meeting, organized by the National Fish and Wildlife Foundation, brought together numerous federal agencies and non-governmental organizations, and other state agencies and industry representatives to encourage them to become partners in an effort to stem the tide of migratory songbird declines. This effort gave birth to what was to become "Partners in Flight," a non-binding cooperative effort among hundreds of partner organizations to work toward the conservation of most terrestrial bird species. By May of 1991, 7 federal agencies had signed an agreement to promote the conservation of neotropical migrants. The USFS alone pledged $6 million per year for five years to the effort, and each of the nine Regions identified approximately $300,000 per year for neotropical migratory bird conservation action. The Partners in Flight effort represents perhaps one of the greatest coups in the history of wildlife biology because it single-handedly moved

the conservation of nongame wildlife into a position of prominence in management circles without ever once using the word "nongame."

Because Hutto had acquired considerable experience with migratory landbird research in both the western United States and western Mexico, he was approached by the USFS Northern Region Wildlife Program to help develop a neotropical migratory bird conservation action plan for that region. By the time the USFS Chief directed the USFS Regions to develop multi-year plans about how to use the earmarked funds; the Northern Region already had a proposal in hand. Although these action plans took somewhat different forms in each Forest Service Region, the Northern Region proposal focused on long term monitoring and habitat relationships. In retrospect, this partnership has demonstrated that academic partners can be of real use to government agencies; academics are generally very good at the synthesis of current information, and are also relatively good at developing proposals for meaningful work.

Early on, we organized a regional coordinating group that included personnel from Forest Service Research to refine aspects of our original proposal. This group gradually added interested partners and eventually evolved into the statewide Partners in Flight coordinating group. The first order of business for the coordinating group was to plan a meeting to discuss the development of a handbook of existing information on migrants (Dobkin 1992), and the development of a pilot project to test the efficacy of on-road vs. off-road counts (Hutto and others 1995). As the University partner, Hutto proceeded to plan, organize, and hire crews for the pilot field project and for a pilot effort to implement the program by 1994, by which time all permanent transects were to be in place and up and running.

It did not take long for us to realize that a program to monitor landbirds for their own sake would carry very little weight in management circles. Remember, this was still in the era where "nongame" issues were pretty much a joke in management-oriented societies and management circles, and the revolution in wildlife biology that occurred because of the emergence of the Society for Conservation Biology had only just begun. If it had not been for the foresight of a few high level managers, and if money had not been identified specifically for neotropical migratory bird conservation, we suspect that very little would have been spent on their behalf in 1990. Fortunately, the combination of a research-oriented perspective from the University partner and a management-needs perspective from the National Forests within the Northern Region led equally rapidly to the realization that landbirds might serve well as a powerful indicator group to address the broader, legally mandated monitoring needs in the USFS Northern Region. Specifically, we recognized that the bird monitoring program might help meet mandates that emerged from federal legislation such as the National Forest Management Act, which requires monitoring activity in order to assess whether vertebrate populations are being maintained throughout the individual National Forests.

There are a number of reasons why birds should be more widely recognized for their utility as effective monitoring tools. As outlined in greater detail elsewhere (Hutto 1998, Hutto and Young 2002, Hutto 2004), (1) landbirds are not only the most visible of vertebrate species, they also advertise their presence and identity through vocalizations. Thus, systematically collected field data are much easier and less expensive to gather for landbirds than they are for traditionally managed species that require trapping, radio tagging, locating, and so forth; (2) a single monitoring method can produce information on numerous species (a trained field crew can collect information on patterns of bird occurrence for well over 100 species using a single, inexpensive, point-based survey method). Sure, many of those species will be too infrequently detected to be monitored well, but having to manage for the maintenance of those that can be monitored will probably bring us much closer to maintaining populations of all vertebrates than would the still prevalent approach of managing entirely on the basis of a select few indicator (mostly game) species; (3) having to manage for the maintenance of many landbird species will force movement toward management at broader spatial scales. This is because, by using birds as monitoring tools, the list of monitored species will now be large enough and ecologically broad enough to reveal some species that will benefit from, and others that will be harmed by, any proposed land-use activity. On the surface, the use of so many species for monitoring purposes would appear to lead managers into a no-win situation because any proposed land-use alternative will hurt something, but the way out of this apparent dilemma comes from expanding one's focus beyond a specific project area. Clear recognition that local populations of some species will invariably be harmed by any proposed land-use action forces one to consider broader landscapes when thinking about the maintenance of populations. It is only at the landscape level that we can provide enough of each landscape element to maintain the populations of, and honestly claim "no effect" on, all vertebrate species. The local extinction of a species due to some land management activity is fine as long as the suitability for that same species is expected to increase at the same time in another part of the landscape (due to some other land-use activity or to ecological succession, for example).

Once the benefits associated with using birds as monitoring tools became better appreciated, the program quickly evolved from one that was put into place specifically to use federally earmarked dollars to address neotropical migratory bird conservation, into a more general region-wide monitoring program using both migratory and nonmigratory landbird species. We must add that an on-going in-house education effort is necessary because it is especially difficult for people to understand that ours is not a bird monitoring program; it is a program that uses birds as a monitoring tool (Hutto and Young 2002)!

There is, of course, the ever-present threat of not being able to commit to the program when money is especially tight. If there were ever a need for strong leadership at the regional level and a need for regional coordination, this is it. Broad-scale monitoring is one endeavor that would not work well if left up to individual Forests or Districts to implement. Most Districts and Forests would probably have little or no desire to do such monitoring on their own, and even if they did, without regional coordination, there would be little hope for the development of a system that would allow data to be merged in a way that might allow for collectively meaningful analyses.

So why is it that the USFS did not work with its own research arm to do develop a monitoring program within the USFS system? The answer is not entirely clear, but from the perspective of congressional appropriations, there is a distinction between research (conducted by the research arm of the USFS) and monitoring (conducted by the management arm of the USFS). This rigid distinction may have hampered the development of a first-class, well-funded, in-house monitoring program. In addition, personnel commitments and the difficulty of accepting "new" Research Station priorities during austere times probably contributed to the way this particular monitoring program unfolded within the Northern Region. Expertise was also an issue in this particular instance. Because the federal earmark involved the development of conservation plans for "neotropical migrants," and because very few research biologists within or outside the USFS had worked with birds as defined that particular way, it was natural to approach a University that harbored an individual who had amassed considerable experience with that group of birds. Thus, the region and the university came together as partners, and the partnership has evolved into a unique formal agreement under which the University works cooperatively with the USFS to "…improve the ability of the Forest Service to monitor population trends and to understand habitat relationships of landbirds across the Northern Region and adjacent lands" and to "(1) increase the understanding of landbird ecology, (2) understand the strengths and limitations of landbird monitoring efforts, (3) monitor the effects of Forest Service management activities on landbirds, and (4) use this information to help revise Forest Plans." In turn, it is intended that the University "…use this information to further education through the development or updating of curricula related to bird ecology and conservation."

That USFS-University of Montana agreement has served as the primary stimulus to create a regentially approved Avian Science Center on the University of Montana campus, which will facilitate growth toward a more comprehensive multi-agency monitoring program for the state as a whole, and will allow us to build a more rapid and effective web-based mode of information dissemination. By attaining full partnership of all organizations that are required by law (or simply desire) to conduct monitoring to assess the effects of their land use practices, we will have achieved a very powerful working model. Indeed, the involvement of numerous agency partners coupled with the central role of University research personnel as data collector, data analyst, and information disseminator helps the agency partners shed the difficulty of having their required monitoring activity appear to be self serving. University academies also house the highest possible level of research expertise and carry the highest level of credibility among peers. These benefits associated with the partnership cannot be overemphasized.

Overall Design of the Monitoring Program

During the design phase of this monitoring program, we suspected that many fledgling monitoring programs had probably come and gone because of a failure to attain the support needed for a long-term commitment to monitoring. In fact, our perception of the main weakness in monitoring programs was, and continues to be, that they tend to be heavy on the data collection and slow or weak on the usefulness of the data collected and on the transfer of information related to results from the monitoring effort. We, therefore, designed the NRLMP to circumvent that potential problem by de-emphasizing the long-term monitoring component and building a new emphasis on what could be called a "habitat relationships monitoring" component and a "short-term management effects monitoring" component. Today, the program is uniquely designed to provide both short- and long-term monitoring activity. The long-term, population trend monitoring component is conducted during even-numbered years and is designed to uncover long-term population trends and habitat relationships of numerous landbird species

within the region (see example web output in fig. 1). The short-term components are drawn from bird-habitat relationships data that emerge from the long-term monitoring component and from separate more focused monitoring efforts (conducted during odd-numbered years), and both are designed to shed light on the ecological effects of various kinds of land use activity.

More detailed description of the design of this monitoring program, and a dialogue concerning aspects of the design are available elsewhere (Hutto and Young 2002, Ellingson and Lukacs 2003, Hutto and Young 2003), but to summarize the main points here, the NRLMP involves the breeding season monitoring of all diurnal (primarily forest) landbird species that can be detected through a single (point-count) methodology. The full-scale long-term monitoring effort involves single visits in every other year to about 350 permanently marked 10-point roadside or trailside transects that were originally positioned in a geographically stratified fashion throughout the region. Transects are positioned primarily within United States Forest Service lands (Northern Region), but some are positioned within the lands owned or managed by other partners that include Plum Creek Timber Company, Potlatch Corporation, Bureau of Land Management, United States Fish and Wildlife Service, National Park Service, Montana Department of Fish Wildlife and Parks, and the Confederated Salish and Kootenai Tribes. The points provide a representative sample of all vegetation cover types that occur within the region, including managed vegetation cover types. The inclusion of managed lands is the key to gaining inference about land-use effects from a retrospective,

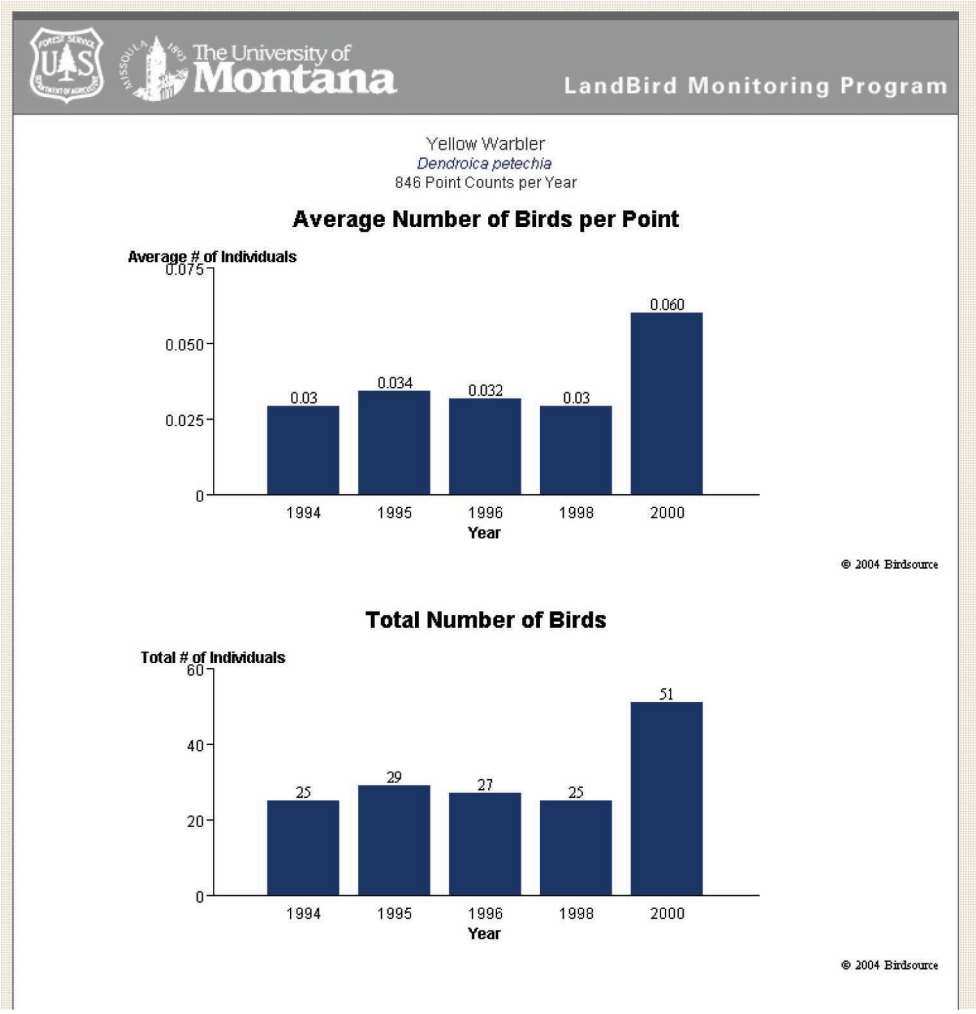

Figure 1. Example of web-based output of population trend data for a single landbird species, the Yellow Warbler. A simple histogram depicting the mean number of birds detected per point (across the 846 points from which this particular species was detected at least once in the six-year period) probably gives a reasonable picture of the status of this bird species until such time that we have enough years to conduct a more meaningful long-term trend analysis.

observational data set. Simply put, if we categorize what is admittedly a continuously variable world into discrete vegetation types, and if we include both heavily managed and less heavily managed lands in the groupings, we can gain insight into land management effects through comparative analyses among categories.

By including vegetation data from the area immediately surrounding each long-term monitoring sample point, we were able to build meaningful habitat-relationship models for more than 50 bird species in a matter of several years (Hutto and Young 1999; see example web-based output in fig. 2). And by including managed lands in the mix, we have been able to use comparative analyses to explore the effects of management activity on birds. While one can always argue that comparative analyses are of limited value, we are encouraged by the fact that the effects of partial-cut timber harvesting (as merely one example of a managed land type) as revealed through a retrospective analysis of data from our long-term monitoring points were the same as those revealed through a separate alternate-year experimental effort that involved a more formal comparison of a large number of replicate treatment and control sites drawn from throughout the forested parts of the region (Young and Hutto 2002).

The permanently marked, long-term monitoring points also avail themselves to before-after/control-impact (BACI) investigative approaches, which are generally assumed to be the most powerful and rapid way to gain knowledge of treatment effects (Stewart-Oaten and others 1986). For example, we were able to use a BACI approach to study the effects of the fires of 2000 in the

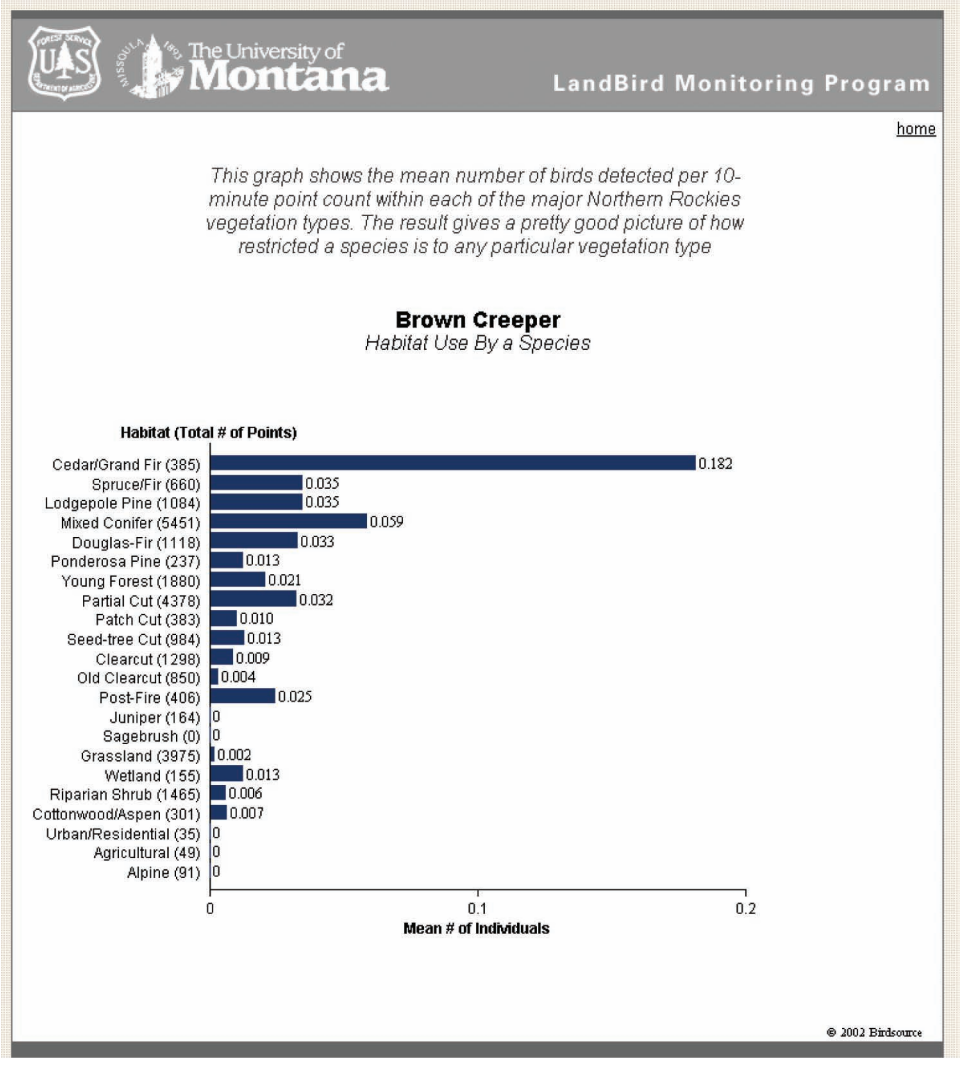

Figure 2. Example of web-based output of habitat relationships data for a single landbird species, the Brown Creeper. The mean number of detections within a 100-m radius around a survey point shows the bird to be relatively commonly detected in (and probably relatively more abundant in) cedar/hemlock forest types. Note the sample sizes associated with each vegetation type.

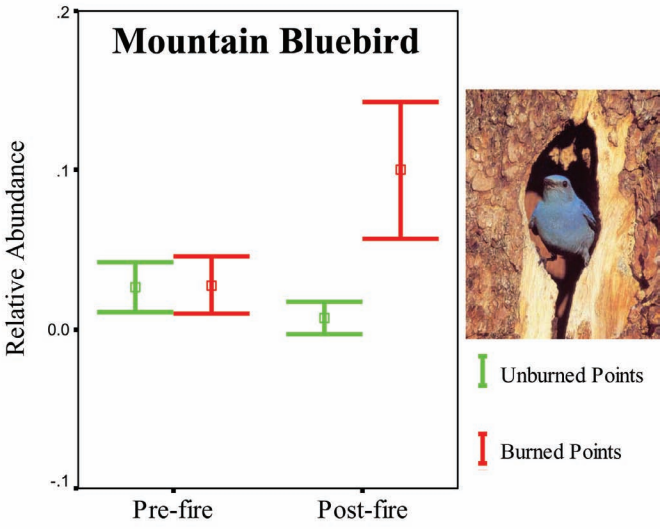

Figure 3. The use of a before-after/control-impact approach to study the effects of fire on landbirds produced results such as this one on Mountain Bluebird, a species that clearly responded positively to the sever fires of 2000 in the Bitterroot Valley, Montana (data from Smucker 2003).

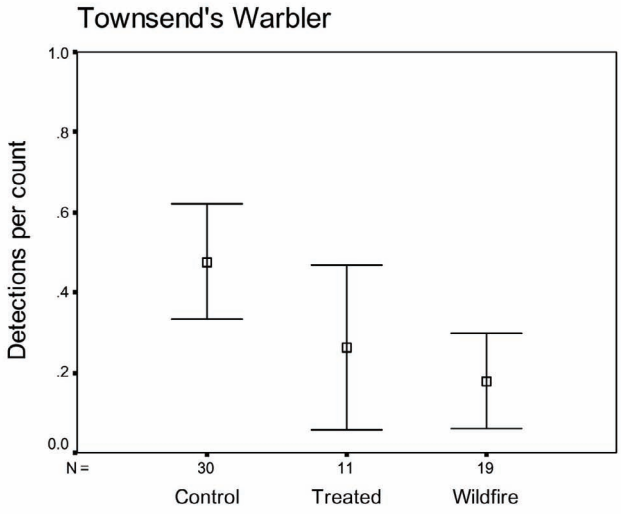

Figure 4. Example results from an alternate-year study designed to test the efficacy of restoration cutting and burning on landbird species. Note that the Townsend's Warbler is affected negatively and equally by experimental restoration treatment and natural wildfire disturbance, while the Hairy Woodpecker is affected positively and similarly by the treatment and natural disturbance. Note also the relatively large sample sizes (numbers of entirely different treatment and control plots scattered across numerous Forests in the Northern Region) associated with this alternate-year study. The utility of birds as meaningful tools for monitoring restoration effects should be apparent.

Bitterroot Valley, Montana, by virtue of the fact that we had about 100 points scattered through the burned area, some of which burned and some of which did not burn (fig. 3). It is nearly impossible to study the effects of severe disturbance events such as crown fires, hurricanes, and floods in a truly experimental arena, so the use of data from established monitoring points both before and after the disturbance will be as good as it can get to gain insight on the effects of such events.

Again, by design, we survey permanently marked long-term monitoring points every other year, which allows for a more focused monitoring effort related to issues of immediate management concern during the years when we do not collect data from the permanently marked points. As discussed elsewhere (Hutto and Young 2002, Hutto 2004), the monitoring crew is large enough (one seasonal technician per forest) to allow us to work with numbers of replicate sites that are greater than all but one of 95 studies published in various ecological, ornithological and conservation journals over the past 25 years (Sallabanks and others 2000). Thus, the power of this program to generate statistically meaningful data is directly linked with the commitment to maintain a large field crew during the alternate years, which we devote to gathering quasi-experimental data on the effects of various land-use practices (e.g., grazing, timber harvesting, prescribed fires) by positioning new sample point locations within treatment and "control" sites that are replicated throughout the region (fig. 4).

We view the short-term monitoring component to be a major strength of the overall monitoring program, but acknowledge that two major challenges will always accompany the inclusion of alternate-year, short-term effects monitoring as part of an overall monitoring program: (1) it can be difficult reaching a consensus among individual National Forests in the Northern Region regarding the focus of alternate-year work, and (2) the time, labor, and logistics associated with having to hit the ground running with a newly designed monitoring effort on an every-other-year basis can be daunting.

At this point, we should re-emphasize that the NRLMP emerged out of a real partnership—the University of Montana had (and continues to provide) the expertise needed to handle the design, training, data management, analysis, and information dissemination components, while the USFS had (and continues to provide) the funding needed to hire seasonal technicians who conduct the actual bird monitoring and it has the management needs that serve as the primary driver of short-term management effects monitoring.

Obstacles to Overcome

Overall, the program is widely viewed as useful and successful, but obstacles that still need to be overcome include (1) the incorporation of monitoring results into a more formal adaptive management cycle within the USFS, (2) the inclusion of additional state, federal, and

private corporation partners so that the program emerges as one part of a more comprehensive statewide (or broader) landbird monitoring program, and (3) recognition that monitoring buy-in involves support for more than the field effort involved with data collection.

With respect to adaptive management, we have noted elsewhere (Hutto and Young 2002) that "if there is one weakness associated with adaptive management in practice, it is the lack of a formal involvement of monitoring participants in the adaptive management loop, where participants have a chance to present results that might bear on future land-use plans." Findings from the NRLMP that we believe have been successful at influencing policy have done so because the information filtered informally into management circles by way of discussions at our annual meetings with USFS Forest biologists. Monitoring results need to be better integrated into a formal management planning cycle that involves 1) gathering long-term and short-term monitoring data, 2) informing planners of results, and 3) discussing whether the results merit a consideration of changes in land-use plans.

With respect to expansion of the program to include all land-owners within the state or larger region, full financial participation in regional monitoring by prospective partners has been difficult to achieve. Ironically, significant financial participation by a broad cross-section of partners in the Northern Rocky Mountain Region was probably hampered from the start because (federally earmarked) USFS dollars were used to get the NRLMP up and running. These earmarked dollars were certainly critical to the development of a landbird monitoring program within the agency, but because the program received most of its funding from the USFS, we naturally labeled it as a "Northern Region" program. This label, in turn, fueled the perception that ours was exclusively a Forest Service program. We currently receive support for a broader monitoring effort from a variety of partners, and we now refer to most of our monitoring activities in the broader context of a multi-partner coordinated statewide monitoring effort. Nonetheless, had we labeled the monitoring effort as a pilot "statewide coordinated bird monitoring program" from the outset, we suspect it might have been easier to bring other partners on board sooner. We are now on the cusp of an expanded partnership between the University of Montana and numerous partners who see the benefit of participating in a coordinated monitoring effort, but only time will tell. Ideally, this and other state programs that are currently underway can evolve into even more ecologically based multi-state programs that use geographically broad ecological units, such as the North American Bird Conservation Initiative's "Bird Conservation Regions" as a basis for monitoring, evaluating, and reporting.

With respect to the issue that effective monitoring involves support for more than field work, potential funding partners generally fail to appreciate that support for monitoring means not just support for field technicians to collect data, but support for as comprehensive a level of data analysis as desirable and as sufficient a level of information transfer as needed to make a real difference. Information transfer in particular (getting the results out and in usable form) is precisely that aspect of the program that is needed to generate program support, and is the only aspect of the program that provides a voice for important monitoring results, but it does not get the attention or funding that it should. How many papers in this symposium, for example, deal with information transfer as it relates to monitoring programs? Because monitoring generally conjures up images of little more than an unending process of amassing data, is it any wonder monitoring is viewed as having little utility, or that such programs tend to have a limited impact on existing management? Information syntheses and information transfer (education) is never as high a priority as it needs to be with monitoring programs. We would even argue that because we already have more than enough definitive "monitoring" results to pass along to those who might find those results useful for their own decision making, we should devote more time and money to toward the synthesis of existing information. In addition, education about monitoring results includes education not just within the partner organizations themselves, but outside the agencies as well. What good does it do if the public does not fully understand, and is not fully supportive of, forest restoration plans, for example? The public-at-large elects politicians who, in turn, have the most powerful influence on policy, so all those elements of education need to be built into an effective monitoring program, and we would suggest that most monitoring programs (including our own) have considerable work to do on that front.

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